The University of Florida, Department of Material Science and Engineering
Nuclear Engineering Program

ENU 4612L: Nuclear Radiation Detection and Instrumentation Laboratory
Addendum to the Lecture Syllabus

Fall Semester 2023

Laboratory Objectives: Provide students with a working knowledge of radiation detectors, detector systems, and their associated electronics. Develop communication skills including technical writing and oral presentations. Prepare students for independent research and/or design projects.

Credit: 1 hours

Instructor: Prof. Kyle C. Hartig kyle.hartig@ufl.edu
352-392-4907
Office hours: TBD
Note: Office hours may change due to laboratory schedule / upcoming travel schedule

Note: For all course-related questions a preferred mode of interaction is to visit the instructor in person during office hours and refrain from using email.

Supervised Teaching Student:
TBA Email: TBA Office hours: TBA


Pre-requisites and Co-requisites:
Pre-requisites for ENU 4612:
• EEL 3003 Elements of Electrical Engineering
• ENU4605 Interaction of Radiation with matter

Meeting Times & Schedule:
Laboratory: The laboratory course does not meet each week. Please see the weekly schedule below and the course website for up-to-date information on the laboratory meeting schedule.

Note: Adjustments to this regular schedule could be made periodically and announced in advance in class and/or through the class website/email.

Meeting Location:
Laboratory: Undergraduate Laboratory (Rhines Hall Basement)

Web Tools: https://elearning.ufl.edu/
The course Canvas site will be used to distribute the syllabus, announcements, slides, grades, etc. I will attempt to place course notes ahead of lectures on Canvas. The notes I post may only contain fragments of the entire lecture. Students are required to attend class and fill in the blanks as necessary, according to written lecture notes dictated in class. Canvas will also be the location to download other posted course materials, such as homework, solution sets, and sample problems.
Contribution of Course to Meeting the Professional Component (ABET only):
   a. Graduates will have successful careers in Nuclear Engineering and related disciplines.
   b. Graduates will pursue continuing education or advanced degrees.

Relationship of Course to ABET Program Rubric: (L – Low, M – Medium, H – High)
This course supports the following program rubric outcomes:
   1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics - L.
   2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors - L.
   3. an ability to communicate effectively with a range of audiences – H.
   6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions - H.
   7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies - L.

Schedule: (subject to adjustments throughout semester) [Hurricanes, pandemics, protests, travel, etc…]

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<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Reading</th>
<th>Lab</th>
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<tbody>
<tr>
<td>23-Aug</td>
<td>Introduction. Syllabus, Sources of Radiation, Radiation Interactions (no quiz this week)</td>
<td>Ch 1 &amp; 2</td>
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<tr>
<td>28-Aug</td>
<td>Radiation Interactions</td>
<td>Ch. 2</td>
<td>Lab 1: Intro., Safety, &amp; OScope Usage</td>
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<td>4-Sep</td>
<td>Labor Day (No class M)</td>
<td>Ch. 3</td>
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<tr>
<td>11-Sep</td>
<td>Counting Statistics (cont.)</td>
<td>Ch. 3</td>
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<tr>
<td>18-Sep</td>
<td>Error Analysis</td>
<td>Ch. 3</td>
<td></td>
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<tr>
<td>25-Sep</td>
<td>Error Analysis (finish), Pulse Shaping &amp; NIM Electronics</td>
<td>Ch. 3, 16, &amp; 17</td>
<td>Lab 2: Nuc. Instruments Electronics</td>
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<tr>
<td>2-Oct</td>
<td>Circuits, Multi-Channel Analyzers and General Detector Properties</td>
<td>Ch. 16-18</td>
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<td>9-Oct</td>
<td>General Detector Properties and Gas Detectors (ion chambers)</td>
<td>Ch. 4</td>
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<td>(Exam 1 - this week?)</td>
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<tr>
<td>16-Oct</td>
<td>Gas Detectors (ion chambers &amp; G-M tubes)</td>
<td>Ch. 5</td>
<td>Lab 3: G-M Detectors</td>
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<td>23-Oct</td>
<td>Gas Detectors (G-M tubes &amp; proportional counters), Scintillators (inorganic)</td>
<td>Ch. 6 &amp; 7</td>
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<td>Week</td>
<td>Topics</td>
<td>Reading</td>
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<td>30-Oct</td>
<td>Scintillators (inorganic &amp; organic), Photomultiplier Tubes &amp; Photodiodes, and Radiation Spectroscopy.</td>
<td>Ch. 6, 8, &amp; 9</td>
<td>Lab 4: NaI Scintillation Detectors</td>
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<td>6-Nov</td>
<td>Radiation Spectroscopy, Semiconductor Detectors Veterans Day (no class W)</td>
<td>Ch. 9 &amp; 10</td>
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<td>13-Nov</td>
<td>Semiconductor Detectors and Silicon &amp; Germanium Detectors (Exam 2 - this week?)</td>
<td>Ch. 10 - 12</td>
<td>Lab 5: High-Purity Germanium Detectors</td>
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<td>20-Nov</td>
<td>Neutron Detection Thanksgiving holiday (no class W &amp; F)! (no quiz this week)</td>
<td>Ch. 14 &amp; 15</td>
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<td>27-Nov</td>
<td>Neutron Detection</td>
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<td>Lab 6: Neutron Detection</td>
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<td>4-Dec</td>
<td>Special Topics*, Jeopardy Final Review, and Final Thoughts (no quiz this week)</td>
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<td>11-Dec</td>
<td>Final Exam (Dec. 14th 1730-1930)</td>
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**Grading:** Your performance in both the lecture and laboratory will be graded separately as they are two different courses. Below is a breakdown for the grading in the laboratory:

- Laboratory:
  - Short Reports - 50%
  - Laboratory Notebook - 10%
  - Worksheets - 15%
  - Quizzes - 25%
  - Late assignment deductions 20% (0-1 day) & 100% >1 day

The following grades will be assigned based on the final score: A, A-, B+, B, C, and E.

**Lab Reports**
You will be required to turn in individual short lab report(s) (a short ~3-5 page tech memo) and (longish ~10 page report(s)). These lab reports will be due 8 days from the date that the lab was performed. Guidelines will be handed out describing what is expected to be included in these reports and the formatting style to be used. Lab reports must be prepared by computer and turned into the class site dropbox in PDF format prior to the deadline. Professional document and figure standards will be enforced on all electronic submissions in this course. The onus is on you to figure out how to meet these standards in whatever programs you use to write the document and make figures. Excel may not be used to prepare figures (plots). It is suggested that students prepare figures (plots) in Python (GnuPlot), MatLAB, Mathematica, Igor Pro, or Origin Pro. I have exactly zero sympathy for those who select a word processor or computer program without knowing how to format their text or figures using it – complaints that the standards are not the same as a particular piece of
software’s defaults will fall on deaf ears. Presentations and additional problems may be assigned as part of the laboratory report submission requirements.

**Quizzes**
A short quiz will be given at the beginning of every lab session. They will consist of 1-2 simple questions that will be taken from the lab information handout given before each session.

**Worksheets**
I will provide the worksheets and lab instruction handouts at the start of each lab session. These worksheets will consist of several questions that each student must answer individually on their own worksheets. At the end of the lab session, I will collect the worksheets for grading. The only exception to this will be weeks where a short report is required. For labs which are assigned a short report you will hold on to the worksheets in order to use the data for your lab reports or PowerPoint slides.

**Laboratory Notebook**
Information about maintaining a laboratory notebook for this course will be given out through the course website and you need to bring your notebook to the first Lab 1 meeting.

*I reserve the right to make edits to the description and requirements of the assignments described above for this course.*

The final grades will be assigned based on:

- A: ≥92%
- A-: ≥88%
- B+: ≥84%
- B: ≥80%
- B-: ≥76%
- C+: ≥72%
- C: ≥68%
- C-: ≥65%
- D+: ≥62%
- D: ≥59%
- D-: ≥56%
- E: <56%

Please note that following:
1. At the end of the course, students overall course grades may be curved up at my discretion.
2. Grading in this course is “plus-based”. That is, I award you points based on correct steps, rather than deducting points for errors. As a result, a question such as, “Prof. Hartig, why did you take off 2 points here?” is both presumptuous and nonsensical, since you didn’t have the points to begin with.
3. There is no general protection against double jeopardy. Points are often allocated, particularly on exams, to each specific step and to obtaining the final, correct answer in each problem – a single error will prevent you from earning points at that step and for the final answer.
4. The grade cut-offs for A, B, and C are somewhat lower than the “high-school scale” (90, 80, 70, etc.) under which many UF courses and syllabi templates operate. This is not to grant inflated letter grades but rather to account for the challenging nature of the course material and to appropriately award genuinely excellent performances.
More information on UF grading policy may be found at:  
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Changes to Syllabus
Changes to this syllabus will be provided via the Canvas platform. Such changes may include those required by policy changes, my travel, changes in the speed of course coverage, university closure, errors in previous syllabus versions, and other reasons.

Collaboration
The ground rules for collaboration should be decided by each group through compromise and consensus. However, regardless of the preferences of the group as a whole, each student retains the individual right to privacy and to maintain good mental and physical health. To this end, no student shall be compelled:

- To join a real-name social networking site or modify their existing use of such a site, or
- To accept a 24/7 or another onerous on-call policy.

That is: each member holds a unilateral veto on using Facebook (or some such) for your group’s work or for being contacted at all hours of the day and night.

Interpersonal issues within your group stemming from deciding group rules must be brought to me promptly for arbitration. This arbitration will focus on the guidelines above and in forming an equitable compromise (essentially, equal marginal/new inconvenience) among group members and not on determining whose activities outside this course (including personal pursuits, situations, and choices) are more meritorious.

The allowed level of collaboration on homework may vary and is specified on the assignment.

Attendance and Expectations:
Students are expected to attend ALL laboratory sessions. Students must participate in each laboratory exercise, including lab quizzes, and produce individual laboratory worksheets for every lab, along with laboratory reports during the semester. Students may make up experiments for valid medical reasons or previously excused reasons. Students must perform ALL laboratory experiments in order to receive a passing grade.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:  
https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/.

Workload: The instructor is aware that senior students have extremely busy semesters. Reasonable accommodations on homework, project, exams, and other requirements will be made for professional commitments (conference attendance, taking the candidacy exam, grad school visits, etc.). Some deadlines may be moved back due to other courses upon reasonable requests; however, deadlines will not be moved more than 24 hours as time-management is an important skill to develop and refine. You will have plenty of warning in your other courses regarding deadlines and it is strongly suggested that you begin using an electronic calendar to track items and develop a logical timeline to success for each assignment in your courses. Note: October and November, for the laboratory course, are particularly impacted by the number laboratories that require reports and you must plan accordingly!

Grade Appeal: All appeals of grades, including those from clerical/grade-calculation errors, must be made within one week of return. (This may be modified for specific assignments near the end of the term. I will announce this via e-mail as needed.)

Grade appeals must be provided in the following format:

- Include your entire assignment unmodified.
- Attach (paper clip preferred) a written summary of which problem(s) or part(s) you believe were graded inaccurately. Be as specific as possible.
• Turn in your appeal to me (virtually or in-person) at class time or during office hours. I will review your grade appeal, contact you via your uf.edu e-mail address, and return the assignment in class. Fairly simple appeals provided to me during office hours may be decided upon while you wait, at my discretion.

Appeals will be considered for clerical errors, addition errors, and inconsistent scoring. Grade appeals will not be entertained if you simply do not like that (for example) Part 1 was worth only 2 points with Part 2 worth 5 points.

On very rare occasions, if I believe the student is not acting in a good faith belief that more points are deserved, I will deem the appeal frivolous. Following two frivolous appeals, your grade appeal privilege through this method will be revoked. Further appeals must be done through the petitions process, which requires formal paperwork and department/program level involvement.

Electronic Communication and Course Website

The primary means of communication with the class outside of class time will be e-mail listserv. These listservs will be sent to your @uf.edu address only. Any inquiries regarding grading will be directed towards your @uf.edu address only, per FERPA.

The primary use of the Canvas website is for file storage, as assignments, lecture notes, etc. may be provided there. I take no responsibility for downtime of this service, nor for actions of University of Florida staff that affect the website (including Canvas upgrades). The gradebook on Canvas is used to enable you to look up grades quickly. Note that this gradebook is not official. I reserve the right to correct errors, including transcription errors, from the official (spreadsheet) gradebook, to which I alone have access, until finalization of grades with the registrar.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code.” On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code: https://www.dso.ufl.edu/sscr/process/student-conduct-honor-code/ specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TA in this class.

Software Use: All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Course Evaluations

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.ag.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluecap.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.ag.ufl.edu/public-results/.

Commitment to a Safe and Inclusive Learning Environment:
The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Jennifer Nappo, Director of Human Resources, 352-392-0904, jennnappo@ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

**Disabilities:** Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, [https://www.dso.ufl.edu/drc](https://www.dso.ufl.edu/drc)) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to me when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester. Please note that UF policy, clarified to faculty during the Fall 2016 term, states that no retroactive accommodations are available.

**UF Counseling Services**

- Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
  - University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
  - SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
  - Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
  - Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

**In-Class Recording**

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publications without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.
Campus Resources:

Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: https://counseling.ufl.edu, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the Office of Title IX Compliance, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.


Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

